

What is claimed is:

1. An air conditioner for a vehicle, comprising:

an air-conditioning case for defining an air passage through which air flows into a passenger compartment, the air-conditioning case having a foot opening from which air is blown toward a lower portion in the passenger compartment, and a face opening from which air is blown toward an upper portion in the passenger compartment;

a blower for blowing air in the air passage into the passenger compartment at least through the foot opening and the face opening;

a heating heat exchanger, disposed in the air-conditioning case upstream from the foot opening and the face opening, for heating air blown by the blower;

a mode switching member for opening and closing the face opening and the foot opening, to set at least a foot mode where the mode switching member closes the face opening and opens the foot opening, a fixed bi-level mode where the mode switching member opens both of the face opening and the foot opening by a predetermined fixed air-blowing ratio between air blown from the face opening and air blown from the foot opening, and a linear bi-level mode where an air blowing ratio from the foot opening is reduced and an air blowing ratio from the face opening is increased as a time passes; and

a control unit for controlling operation of the mode switching member,

wherein the control unit controls the mode switching member to perform the foot mode, the linear bi-level mode and the fixed bi-level mode in this order as the time passes in a warming-up control in which a temperature of air to be blown into the passenger

compartment is increased by the heating heat exchanger after a start of a heating operation for heating the passenger compartment.

2. The air conditioner according to claim 1, wherein the linear bi-level mode is started from a state in the foot mode.

3. The air conditioner according to claim 1, wherein the linear bi-level mode is started from a state in which air is blown mainly from the foot opening while air is blown from the face opening by an air blowing ratio smaller than a predetermined ratio.

4. The air conditioner according to claim 1, wherein: the mode switching member is disposed to further set another linear bi-level mode in which the air blowing ratio from the foot opening is increased while the air blowing ratio from the face opening is reduced, as compared with the fixed bi-level mode, as the time passes; and

the control unit controls the mode switching member to perform the another linear bi-level mode and the foot mode in this order after the fixed bi-level mode is performed.

5. The air conditioner according to claim 4, wherein the control unit performs one of the linear bi-level mode, the another linear bi-level mode and the fixed bi-level mode for a predetermined time that is set by a timer.

6. The vehicle air conditioner according to claim 4, wherein:
the control unit performs the linear bi-level mode for a first predetermined time, and performs the additional linear bi-level mode for a second predetermined time; and
the first predetermined time is longer than the second predetermined time.

7. The air conditioner according to claim 6, further comprising
an outside temperature sensor for detecting a temperature of outside air outside the passenger compartment;
wherein the first predetermined time and the second predetermined time are changed in accordance with the temperature of outside air.

8. The air conditioner according to claim 1, further comprising:
an air duct for defining a ceiling air passage into which air from the face opening is introduced, the ceiling air passage being provided along a ceiling portion in the passenger compartment, wherein:

the air duct has a lower portion having a plurality of ceiling air outlets from which air introduced into the ceiling air passage is blown downwardly into the passenger compartment.

9. The air conditioner according to claim 8, wherein

the ceiling air passage is provided substantially on an entire area of the ceiling portion.

10. An air conditioner for a vehicle, comprising:

an air-conditioning case for defining an air passage through which air flows into a passenger compartment of the vehicle, the air-conditioning case having a foot opening from which air is blown toward a lower portion in the passenger compartment, and a face opening from which air is blown toward an upper portion in the passenger compartment;

a blower for blowing air in the air passage into the passenger compartment at least through the foot opening and the face opening;

a heating heat exchanger, disposed in the air-conditioning case upstream from the foot opening and the face opening, for heating air blown by the blower;

a mode switching member for opening and closing the face opening and the foot opening, to set at least a foot mode where the mode switching member closes the face opening and opens the foot opening, a fixed bi-level mode where the mode switching member opens both of the face opening and the foot opening by a predetermined fixed air-blowing ratio between air blown from the face opening and air blown from the foot opening, and a linear bi-level mode where an air blowing ratio from the foot opening is increased and an air blowing ratio from the face opening is reduced as a time passes as compared with the fixed bi-level mode; and

a control unit for controlling operation of the mode switching member,

wherein the control unit controls the mode switching member to perform the foot mode, the fixed bi-level mode and the linear bi-level mode in this order as the time passes in a warming-up control in which a temperature of air to be blown into the passenger compartment is increased by the heating heat exchanger after a start of a heating operation for heating the passenger compartment.

11. The air conditioner according to claim 10, wherein the control unit performs the linear bi-level mode for a predetermined time that is set by a timer.

12. The air conditioner according to claim 11, wherein:
the fixed linear bi-level mode includes a first fixed bi-level mode in which air is blown mainly from the foot opening while air is blown from the face opening by an air blowing ratio smaller than a predetermined ratio, and a second fixed bi-level mode in which the air blowing ratio from the face opening is increased more than the predetermined ratio; and

the control unit performs the second fixed bi-level mode after the first fixed bi-level mode is performed.

13. The air conditioner according to claim 10, further comprising:

an air duct for defining a ceiling air passage into which air from the face opening is introduced, the ceiling air passage being provided along a ceiling portion in the passenger compartment, wherein:

the air duct has a lower portion having a plurality of ceiling air outlets from which air is blown downwardly into the passenger compartment.

14. The air conditioner according to claim 13, wherein the ceiling air passage is provided substantially on an entire area of the ceiling portion.

15. The air conditioner according to claim 10, further comprising

an outside temperature sensor for detecting a temperature of outside air outside the passenger compartment, wherein:

the control unit performs the linear bi-level mode for a predetermined time; and

the predetermined time is changed in accordance with the temperature of outside air.

16. An air conditioner for a vehicle, comprising:

an air-conditioning case for defining an air passage through which air flows into a passenger compartment, the air-conditioning case having a foot opening from which air is blown toward a lower portion in the passenger compartment, and a face opening from which air is blown toward an upper portion in the passenger compartment;

a blower for blowing air in the air passage into the passenger compartment at least through the foot opening and the face opening;

a heating heat exchanger, disposed in the air-conditioning case upstream from the foot opening and the face opening, for heating

air blown by the blower;

a mode switching member for opening and closing the face opening and the foot opening, to set at least a foot mode where the mode switching member closes the face opening and opens the foot opening, a fixed bi-level mode where the mode switching member opens both of the face opening and the foot opening by a predetermined fixed air-blowing ratio between air blown from the face opening and air blown from the foot opening, and a linear bi-level mode where an air blowing ratio from the foot opening and an air blowing ratio from the face opening are gradually changed as a time passe; and

a control unit for controlling operation of the mode switching member,

wherein the control unit controls the mode switching member to perform the linear bi-level mode between the foot mode and the fixed bi-level mode, in a warming-up control in which a temperature of air to be blown into the passenger compartment is increased by the heating heat exchanger after a start of a heating operation for heating the passenger compartment.